

ELECTRICAL CONTACTING OF THIN ENAMELED WIRES
OF SECONDARY WINDINGS OF IGNITION COILS
HAVING A CONTACT CROWN AND CONTACT ELEMENT

Field Of The Invention

The present invention relates to an electrical connection setup for manufacturing an ignition coil, particularly a rod-type ignition coil having ~~an ignition coil red~~ *a coil shell* with a high-voltage outlet as well as a low-voltage outlet.

5 Background Information

Ignition coils produce high-voltage sparks. This spark ~~ares~~ *flashes over* between the electrodes of the spark plug set up at the ignition coil, thus igniting the air-gasoline mixture of an internal combustion engine, for example. Normally, this spark plug ~~having an ignition coil~~ *is supplied with high voltage from an ignition coil*. A primary winding and a corresponding secondary
10 winding are provided within the ignition coil. At one end, the primary winding is ~~connected~~ *coupled* to an ignition and starting switch, while its other end is connected to a so-called contact breaker.

The secondary winding, that is, the winding responsible for generating the ignition spark, is connected in the interior of the ignition coil to the one end of the primary winding, so that it is
15 grounded. The other end of the secondary winding is connected to the high-voltage outlet, which in turn is ~~either~~ *connected either* to an ignition cable ~~that leads~~ *leading* to the spark plug, or at which the spark plug is set up directly.

The secondary winding itself is made *up* of a thin wire *which is* coated with a suitable layer of enamel so as to avoid the contacting of the individual wires when wrapping ~~a specific support~~
20 ~~part of~~ *the* coil shell. Once the secondary windings have been wound onto ~~at~~ *the* coil shell, the ends of the ~~respective~~ *individual* wires are contacted. Normally, thermal contacting methods such as soldering or welding, for example, are known for this purpose.

~~Disadvantages of~~ *Different work processes are required especially with regard to the Related*
~~Art~~ *The* contacting of the primary and secondary windings, ~~in particular, requires different~~

work processes. This entails higher installation costs, multiple assembly steps and also a certain number of connecting parts necessary to make an appropriate electrical connection.

Furthermore, in such a *very* tight installation space, it was often difficult to bring about an appropriate contacting using the known thermal methods.

5 ~~Objects of the~~Summary Of The Invention~~The object~~

*It is the objective of the present invention is to ~~provide~~produce a connection setup ~~between an ignition coil rod, an ignition coil and~~in a secondary or primary winding which is *implementable in an inexpensive and ~~readily implemented~~simple manner.**

~~Attainment of the Objective~~

- 10 The basic principle for achieving the objective is to replace the thermal contacting method known per se from the related art. This is achieved by providing additional contacting elements that rupture the enamel-coated wire of the ~~primary or~~ secondary winding during installation, *and thus ~~bringing~~bring about an appropriate contacting.*

~~This objective is achieved by the features of Claim 1.~~

15 ~~Summary of the Invention~~

Compared to the previous method, the “cold” contacting method ~~proposed~~*provided* here has the advantage that it involves no additional installation costs. ~~Furthermore~~*In addition*, the ~~setup~~*system* of the present invention makes it possible to reduce the number of assembly steps and also the number of connecting parts.

- 20 A further important advantage of the present invention is that the implementation of the contacting does not require the installation space to be optimized. ~~That is to say,~~*This means that* it will not be necessary to reserve free space in the area of contacting, e.g. for electrode holders, soldering irons or the like.

- 25 According to the present invention, *it is provided that* a contact element is inserted on the side of the low-voltage outlet via guidance means. The contact element is designed such that the one end fans out in *a tulip shape in the sliding direction*~~in a tulip shape~~ and in this manner slides over the primary winding situated on the coil shell during the sliding operation. The other end is designed such that it is able to be fixed in position in a pocket.

- 30 For better sliding characteristics, the contact element additionally has a sliding surface pointing toward the primary winding.

By placing a primary coil shell over at least a portion of the *secondary* coil shell, the free end of the contact element with its sliding surface is pressed down by a lip *which is* situated within the primary coil shell.

Once a defined position has been reached, the *contact element with its sliding surface* of the ~~contact element~~ presses against the insulation-coated wires of the *secondary* coil shell, which causes the insulation to ~~be ruptured~~ *rupture* at the corresponding contact points, thus allowing an electrical contact to be ~~produced~~ *established* between the individual wires of the *secondary* coil shell and the contact element.

The contact element is preferably designed such that it has a waist to achieve its mechanical spring-type characteristics.

~~In particular on~~ On the side of the high-voltage outlet, *in particular*, the contact elements configured according to the present invention are combined in the form of a contact crown. ~~On their sides facing away from the sliding surface, the~~ The individual contact elements according to the present invention are fixed in place on a ring element *on their side facing away from the sliding surface*. This contact crown is preferably a one-piece component; *it being conceivable that* the contact crown ~~may conceivably~~ *is able to* be produced in a single working process (punching and bending).

When the contact crown is slipped over the secondary windings, the individual contact elements slide on the surface of the winding. The tulip—shaped design of the contact crown prevents ~~the winding from being displaced or damaged~~ *displacement of or damage to the windings*. A limit stop, which simultaneously accommodates the end of the secondary winding in the form of a tie-up post, defines the position of the contact crown. This is also ~~the result of~~ *attributable* the fact that the diameter of the contact crown is larger than the secondary coil shell plus two times the diameter of the secondary winding.

In a further step, a ring element is slipped over the contact crown, by which a press fit of the contact element on the secondary winding, and thus a contacting of the contact elements of the contact crown with the secondary winding, is achieved.

~~Further advantageous embodiments will become apparent from the following description as well as the drawings and the claims.~~

Brief Description of the Drawing ~~The figures show:~~ Of The Drawings

Fig. 1 shows a perspective view of an ignition coil having one side for the high-voltage outlet and another side for the low-voltage outlet.

Fig. 1 ~~—A perspective view of an ignition coil having one side for the high-voltage outlet and another side for the low-voltage outlet;~~ Fig. 2 ~~—A2 shows a sectional view through the ignition coil according to Fig. 4;1.~~

- 5 Fig. 3 ~~A shows a perspective view of an ignition~~ *a secondary coil rod located shell, which is situated in the ignition coil housing shown in Fig. 4;1.*

Fig. 4 ~~A shows a perspective view of the side of the low-voltage outlet of an ignition~~ *the secondary coil; shell.*

Fig. 5 ~~A shows a perspective view of a contact element according to the present invention;~~

- 10 Fig. 6 ~~A shows a perspective view of the side of the low-voltage outlet of the ignition coil rod having the contact element of the present invention, according to Figure 5;~~ Fig. 5.

Fig. 7 ~~Another shows another perspective view of the side of the low-voltage outlet of the ignition secondary coil rod shell having the contact element of the present invention, according to Figure~~ Fig. 5, but without the secondary winding being shown;

- 15 Fig. 8 ~~A shows a perspective view of a contact crown according to the present invention, essentially made up of the contact elements according to Figure 7;~~ Fig. 7.

Fig. 9 ~~A shows a perspective view of the side of the high-voltage outlet of an ignition~~ *the secondary coil shell with an illustration of the contact crown of the present invention; according to Figure 8.* Fig. 8 being shown.

- 20 Detailed Description of an Exemplary Embodiment

Fig. 1 shows a perspective view of an ignition coil 1. Ignition coil 1 includes an ignition coil housing 2 and ~~an ignition~~ *a secondary coil rod shell* 3 located in ignition coil housing 2. In addition, ignition coil 1 features a side for a high-voltage outlet H and a side for ~~the~~ low-voltage outlet N. The side of low-voltage outlet N is provided to establish contact with a power supply not detailed in the drawing, while the side of high-voltage outlet H is provided for connecting to an ignition cable or a spark plug not detailed in the drawing.

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Figure 2 shows a sectional view of ignition coil 1 illustrated in Figure 1; the areas shown ~~relating~~ relate to essential features of the present invention which are shown in greater detail in the subsequent figures.

Figure 3 shows ignition coil rod 3 ~~having~~ with one side for high-voltage outlet H and one side for low-voltage-outlet N, which, immediately following its assembly, is ~~insertable~~ able to be inserted as a unit into ignition coil housing 2 illustrated in Figures 1 and 2.

Side of low-voltage outlet N

Figure 4 shows an enlarged representation of the side of low-voltage outlet N of ~~an ignition~~ a secondary coil 1. ~~A shell 3. It is provided to wind a wire is wound~~ 4 onto a secondary coil shell 4, 3, so that ~~primary~~ winding 5 provided here ~~will result~~ results. One end of the wire 4 of ~~primary~~ winding 5 is attached to a so-called tie-up post 6, 6 from which the wire 4 is wound onto the peripheral surface of secondary coil shell 4, 3 and extends over a defined contact area. This contact area at the same time serves as contacting area 7 for a contact element 8, shown in the additional figures, for establishing an electrical contact between ~~primary~~ winding 5 and contact element 8 itself.

Figure 5 shows contact element 8 according to the present invention. It is formed in one piece and essentially made up of two regions, i.e., a contact region 9 and a fixation region 10, the two regions being separated from one another by a waist 11. ~~In particular in contact region 9,~~ ~~contact~~ Contact element 8 ~~has a form that fans out in the shape of a tulip;~~ in contact region 9, and it has on its one side 12 a sliding surface 13 which slides over ~~contact region 9 of~~ ~~primary~~ contacting area 7 of winding 5 during installation of contact element 8.

~~After primary~~ Once winding 5 (cf. Figures Figs. 6 and 7) on coil shell 4 has been produced; on secondary coil shell 3, contacting area 7 ~~will be~~ is completely covered by ~~primary~~ winding 5. Subsequently, contact element 8 is slid ~~over guide means 10~~ in the direction of arrow 14 according to ~~Figure 6~~ Fig. 6. into guide means 15 situated on secondary coil shell 3. In the process, contact element 8 slides along contacting area 7 of ~~primary~~ winding 5 until it is fixed in place in the pocket-type form ~~16~~ 16 of guide means 15. In an additional step, a primary coil shell 17 is slipped over in the direction of arrow 18. ~~Lips~~ In the installed state of primary coil shell 17, lips 19, which are ~~disposed in the form of anvils and situated inside primary coil shell 17 and have the form of an anvil,~~ in the mounted state of primary coil shell 17, press one side onto ~~primary~~ winding 5 and cause the ~~insulating~~ insulation layer of wire 4 of winding 5 to

rupture. ~~Thus,~~*In this way* an electrical connection has been established without the use of a thermal method.

Side of high-voltage outlet H

5 In another development, Figure 8 shows a contact crown 20, which is made up of a plurality of contact elements 8 ~~which~~*a that* are mounted ~~in their fixation region 10~~ on a ring element 21. In the exemplary embodiment shown here, contact crown 20 has been formed in one piece. Individual contact elements 8a of contact crown 20 fan out *in the form of a tulip* in the direction of their contact regions 9 ~~in the form of a tulip~~.

10 To install contact crown 20 according to Figure 8 on a ~~secondary~~ coil shell 43 (Figure 9), cup-shaped contact crown 20 is slid onto the region of high-voltage outlet H ~~of an ignition coil~~ ~~4~~ in the direction of arrow 21, 22 until ring element 21 has reached a tie-up post 6'. This type of design of a limit stop is used to produce a correctly implemented position of contact crown 20 with respect to contacting area 7' or 9a of ~~secondary~~ winding 5' or contact elements 8-8a.

15 Sliding a ~~secondary coil shell 22~~ *ring element 23* *able to be contacted via a spark plug* in the direction of arrow 18, 22 causes contact regions 9a of ~~the respective~~ *individual* contact elements 8a to be pressed against ~~secondary~~ winding 5' in its contacting area 7' since lips 23, 24 are ~~likewise also~~ provided inside ~~secondary coil shell 22~~ *ring element 23*, which press them against ~~secondary~~ winding 5' in the installed state and thereby ~~produce an~~ *establish* electrical contacting by rupturing the insulation.

Abstract Of The present Disclosure

The invention relates to an *An electrical connection setup for manufacturing an ignition coil, which is to replace current contacting methods* set-up for connecting thin enameled wires in ignition coils *such as, which is to replace thermal methods*, for example. The object of the present invention This is achieved in that ~~an individual contact element (8) is provided~~, to produce contacting between the ~~primary or secondary winding (5, 5')~~ and the ~~individual~~ *respective* high-voltage or low-voltage outlets ~~(H, N)~~, *the, an individual* contact element ~~being able to be slid over the primary or secondary winding (5, 5') by its one side; and being~~ *is* fixed in place ~~by~~ *via* its other side, the contact element (8) having a spring-type design, a sliding surface ~~(13)~~, and *at least on its one side* fans out in the shape of a tulip-shape in the sliding direction ~~(arrow 18)~~ *at least on its one side*, in such a way that ~~in the mounted state~~ the contact element (8) presses ~~on~~ *against* the ~~primary or secondary winding (5, 5')~~ in a spring-like manner *in the mounted state* and the insulation layer is ruptured and electrical contacting takes place.

~~(Fig. 9)~~